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(71) Applicant (for all designated States except US): UNO PLAST A/S [DK/DK]; Amtsvejen, DK-3390 Hundested (DK). (72) Inventor; and (75) Inventor/Applicant (for US only): SVENDSEN, Gunnar [DK/DK]; Dalvej 14, DK-4040 Jyllinge (DK). (74) Agent: LEHMANN & REE; Frederiksberg Allé 26, DK-1820 Frederiksberg C (DK).			
(54) Title: AN APPARATUS FOR THE COLLECTION AND MEASUREMENT OF BODY LIQUIDS			
(57) Abstract <p>An apparatus for the collection and measurement of urine comprising a measuring vessel (1) with a liquid outlet (11) connected to a urine bag (10) suspended from the measuring vessel (1) the liquid outlet (11) comprising a valve seat (3) for a hollow axially displaceable valve body (2) which is divided into a reception chamber and an overflow chamber the latter of which being directly connected to the liquid outlet (11).</p>			

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An apparatus for the collection and measurement of body liquids.

The present invention relates to an apparatus for the collection and measurement of body liquids, which apparatus comprises a measuring vessel divided into at least two measuring chambers and having at its upper end a liquid inlet and at its lower end a liquid outlet provided with a valve and a liquid collection bag connected to the liquid outlet and suspended from the measuring vessel.

10 Apparatus of the kind defined above are used e.g. in hospitals for monitoring the urine discharge from bedridden patients and in particular from patients with catheters inserted into their urine bladders.

15 The catheter is connected to the liquid inlet of the measuring vessel and the measuring vessel and the urine bag connected thereto are typically suspended from the side of the patient's bed. The urine bag may for instance be suspended from two hooks mounted on carrier arms extending from the measuring vessel. When the patient 20 is transported in his bed from one place to another or is moved into another bed the measuring vessel and the urine bag are normally positioned in an inclined position between the patient's legs.

An apparatus as described above is known from EP patent publication 25 No. 0,008,450. The known apparatus comprises a measuring vessel divided into four measuring chambers by four substantially vertical separating walls and an overflow chamber which is directly connected to the urine bag. The four measuring chambers may be selectively connected to the urine bag by means of a valve thus permitting 30 selective transfer of the contents of the measuring chambers into the urine bag. The separating walls between said chambers are designed so as to permit the urine to overflow into the second chamber once the first is filled, and so on.

35 If the measuring vessel is positioned in an inclined position e.g. in connection with the above discussed movement of a bedridden patient there is a risk involved in using the prior art apparatus in that urine may unintentionnally flow from one measuring chamber to another and optionally into the overflow chamber thus preventing

accurate reading of the amount of urine discharged within a certain period of time.

It is the object of the present invention to avoid such unintentional overflow of body liquid from one measuring chamber to another or to the liquid collection bag when the apparatus is placed in an inclined position.

It is a further object of the invention to provide an apparatus of a simpler construction and operation than those of the known apparatus.

These objects are obtained with the apparatus according to the invention said apparatus being characterized in that the liquid outlet has the shape of a valve seat for a hollow valve body which is axially displacable within the measuring chamber, the interior of the valve body being divided into (a) a reception chamber connected to the liquid inlet and having at the lower end of the valve body at least one outlet opening which in the closed position of the valve body is closed by the valve seat, and which at its upper part is connected to the measuring vessel through at least one hole in the chamber wall, and (b) an overflow chamber having at its lower end a duct which is directly connected to the liquid outlet of the measuring vessel and which at its top end is connected to the measuring vessel via a hole in the chamber wall, the holes connecting the reception chamber to the measuring vessel and the measuring vessel to the overflow chamber being placed on the same side of the hollow valve body.

When the hollow valve body is in its closed position the outlet opening of the reception chamber is closed by the valve seat as mentioned above and consequently the liquid introduced into the reception chamber gradually fills said chamber which is preferably provided with graduations indicating the amount of liquid contained therein.

When the liquid levels with the hole in the chamber wall the introduction of additional liquid will cause overflow of liquid into the measuring vessel proper, which measuring vessel is thus gradually

filled. When the liquid surface in the measuring vessel has reached the level of the hole in the overflow chamber the introduction of additional liquid will cause overflow into the overflow chamber and through the duct being in communication with the liquid outlet into 5 the liquid collection bag.

When emptying the inlet chamber and the measuring vessel the valve body is lifted from the valve seat. This causes the liquid in the reception chamber to flow out through the outlet opening at the 10 lower end of the chamber and allows the flow of liquid to pass from the measuring vessel to the liquid outlet and from here into the liquid collection bag.

Since the holes in the above-mentioned valve body are placed on the 15 same side of the hollow valve body the apparatus may be positioned in an inclined position or horizontally provided said holes face upwards without causing unintentional overflow of liquid from reception chamber to measuring vessel and overflow chamber.

20 The upper end of the hollow valve body may be provided with a radially extending protrusion placed in a helical groove on the inside of a surrounding part of the measuring vessel. This construction permits a controlled axial displacement of the hollow valve body above the valve seat by turning of the valve body.

25 To facilitate turning of the hollow valve body said valve body is preferably provided with a radially extending wing at its top end.

According to the invention one or several protrusions touching the 30 outside of the valve body and serving as a guide therefor may be located on the inside of the measuring vessel.

In order to provide a liquid tight connection between the valve body and the valve seat in the closed position of the valve the valve 35 body is preferably provided with two annular grooves for O-rings in the area where the valve body is in contact with the valve seat.

A similar annular groove with an O-ring is preferably provided at the upper end of the valve body. The latter sealing arrangement

prevents outflow of liquid from the measuring vessel at the upper end of same.

The upper end of the valve body is preferably closed by a cover and
5 the cover preferably comprises a liquid inlet comprising a tubular member having an inclined end surface covered by a valve flap preventing back flow of liquid. Preferably the cover also comprises an opening which is covered by an air permeable and liquid proof filter which permits an outflow of air but not of liquid as the
10 reception chamber and the measuring vessel is filled with liquid and which permits an inflow of air when liquid is transferred to the collection bag.

The invention will now be described more in detail with reference to
15 the accompanying drawings wherein

Figure 1 shows a front view of a preferred embodiment of the apparatus of the invention,

20 Figure 2 is a vertical sectional view of the lower part of the valve body shown in figure 1,

Figure 3 is a side view of the valve body of Figure 2,

25 Figure 4 is a sectional view along the line III-III through the valve body of Figure 3,

Figure 5 is a front view of the back wall of the measuring vessel of the apparatus of Figure 1,

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Figure 6 shows the upper part of the valve body of Figure 1 seen from the bottom, and

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Figure 7 shows the upper part of the valve body illustrated in fig. 6 in sectional view.

In the drawing 1 designates a measuring vessel in which a hollow valve body 2 is placed which is axially displacable by rotation and which at its lower end is in contact with a valve seat 3 and is

closed at the top with a cover 4. At opposite sides of the measuring vessel 1 there are provided protrusions 5 and 6 for fixing the ends of suspension straps (not shown).

5 The measuring vessel 1 also comprises a pair of carrier arms 7 ending in double hooks for insertion into holes 9 at the top end of a liquid collection bag 10 having a liquid inlet 11. At its lower end the liquid collection bag 10 is provided with a liquid outlet 12 in which a pipe 13 is positioned provided with a valve 14.

10 A wing 15 is attached to the cover 4 of the valve body 2, which cover will be described more in detail in the following.

15 As it will appear from Figures 2-4 the valve body is constructed with two chambers; a reception chamber 20 and an overflow chamber 21.

20 At its lower end the reception chamber 20 is provided with two holes 22 ending in a valve surface 23 which contacts the valve seat 3 in its closed position thus preventing liquid outflow. At the upper end of the reception chamber 20 two holes 24 are provided in the wall separating the chamber 20 from the surrounding measuring vessel 1.

25 At its lower end the overflow chamber 21 is provided with a duct 25 through which said overflow chamber is in direct contact with the liquid outlet 12 of the measuring vessel 1. At the top end of the overflow chamber 21 a hole 26 is provided in the valve wall.

30 Two annular-shaped grooves 27 each comprising an O-ring (not shown) are provided on the outside of the valve body 2 at the lower end thereof.

Similarly, an annular groove 28 comprising an O-ring is provided.

35 The outside of the valve body 2 is also provided with a projection 29 which is inserted in a helical groove 30 formed on the inside of the back wall of the measuring vessel 1, cf. Figure 5.

As will also appear from Fig. 5 the rear wall comprises two protru-

sions 31 serving as a guide for the lower part of the valve body 2.

As will appear from Figures 6 and 7 the cover 4 of the hollow valve body is provided with two openings one being a tubular member 40 ending in an inclined surface 41 covered by a rubber flap (not shown) permitting the introduction of liquid and preventing the back flow of same. A catheter tube 42 is attached (cf. Figure 1) to said tubular member.

- 10 Next to the tubular member 40 a ventilation opening 43 is provided which is partially covered by support ribs 44 supporting an air filter (not shown).

The cover 4 is preferably welded onto the valve body 2.

15 The shown apparatus operates as follows:

The liquid introduced through the catheter tube 42 passes down into the reception chamber 20 inside the valve body 2 via the tubular member 40. In its initial (closed) position the valve surface 23 of the valve body 2 is in contact with the valve seat 3 and consequently no liquid is allowed to pass through the holes 22. Therefore, the liquid level in the reception chamber will rise and using a suitable measurement scale, e.g. in the form of graduation marks on the outside of the valve body 2 and a transparent construction material, the volume of the collected liquid at a given time may be read.

When the liquid surface has reached the level of the holes 24 the 30 introduction of additional liquid starts filling of the measuring vessel. The vessel 1 may also be graduated so as to allow for the amount of liquid contained therein to be read off at a given time.

If additional amounts of liquid are introduced the measuring vessel 35 1 is also filled and through the hole 26 an overflow of liquid from the measuring vessel 1 into the overflow chamber 23 may occur. From here the liquid passes via the duct 25 down through the liquid outlet 12 and into the liquid collection bag 10.

At this time or at any earlier desired time the reception chamber 20 as well as the measuring vessel 1 may be emptied by clockwise rotation of the wing 15. Such rotation causes the valve body 2 to be rotated and because the projection 29 is located in the groove 30 5 the valve body is lifted upwards in connection with the rotation thus removing the valve surface 23 from the valve seat 3. Hence it is rendered possible to empty the reception chamber 20 quickly through the holes 22 and the measuring vessel 1 through the space between the valve surface 23 and the valve seat 3 as the liquid 10 flows down into the liquid collection bag 10 through the liquid outlet 11.

The generation of a superatmospheric or subatmospheric pressure in chambers 20 and 21 as well as in the measuring chamber 1 during 15 liquid inflow and outflow, respectively, is avoided due to an air flow being allowed through the filter provided in the ventilation opening 43.

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Claims

1. An apparatus for the collection and measuring of body liquids, said apparatus comprising a measuring vessel divided into at least two measuring chambers and having at its top end a liquid inlet and at its lower end a liquid outlet provided with a valve and a liquid collection bag connected to the liquid outlet and suspended from the measuring vessel, characterized in that the liquid outlet has the shape of a valve seat for a hollow valve body which is axially displacable within the measuring vessel, the interior of the valve body being divided into (1) a reception chamber connected to the liquid inlet and having at the lower end of the valve body at least one outlet opening which in the closed position of the valve body is closed by the valve seat and which is at its upper part is connected to the measuring vessel through at least one hole in the chamber wall, and (2) an overflow chamber having at its lower end a duct which is directly connected to the liquid outlet of the measuring vessel and which at its top end is connected to the measuring vessel via a hole in the chamber wall, the holes connecting the reception chamber to the measuring vessel and the measuring vessel to the overflow chamber being placed on the same side of the hollow valve body.
2. An apparatus according to claim 1, characterized in that the valve body has at its upper end a protrusion extending radially from the outside of the valve body which protrusion is placed in a helical groove on the inside of a surrounding part of the measuring vessel so as to cause an axial displacement of the valve body by rotation of the valve body .
3. An apparatus according to claim 2, characterized in that the valve body is provided with a radially extending wing at its upper end.
4. An apparatus according to claim 1, characterized in that the inside of the measuring vessel comprises one or several protrusions which are in contact with the outside of the valve body and serve as a guide for same.

5. An apparatus according to any one of the preceding claims, characterized in that two annular grooves for O-rings are provided in that zone of the valve body which is in contact with the valve seat in its closed position.

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6. An apparatus according to any one of the preceding claims, characterized in that the valve body is closed at the top by a cover.

10 7. An apparatus according to claim 6, characterized in that in the cover comprises a liquid inlet in the form of a tubular member having an inclined end surface covered by a valve flap.

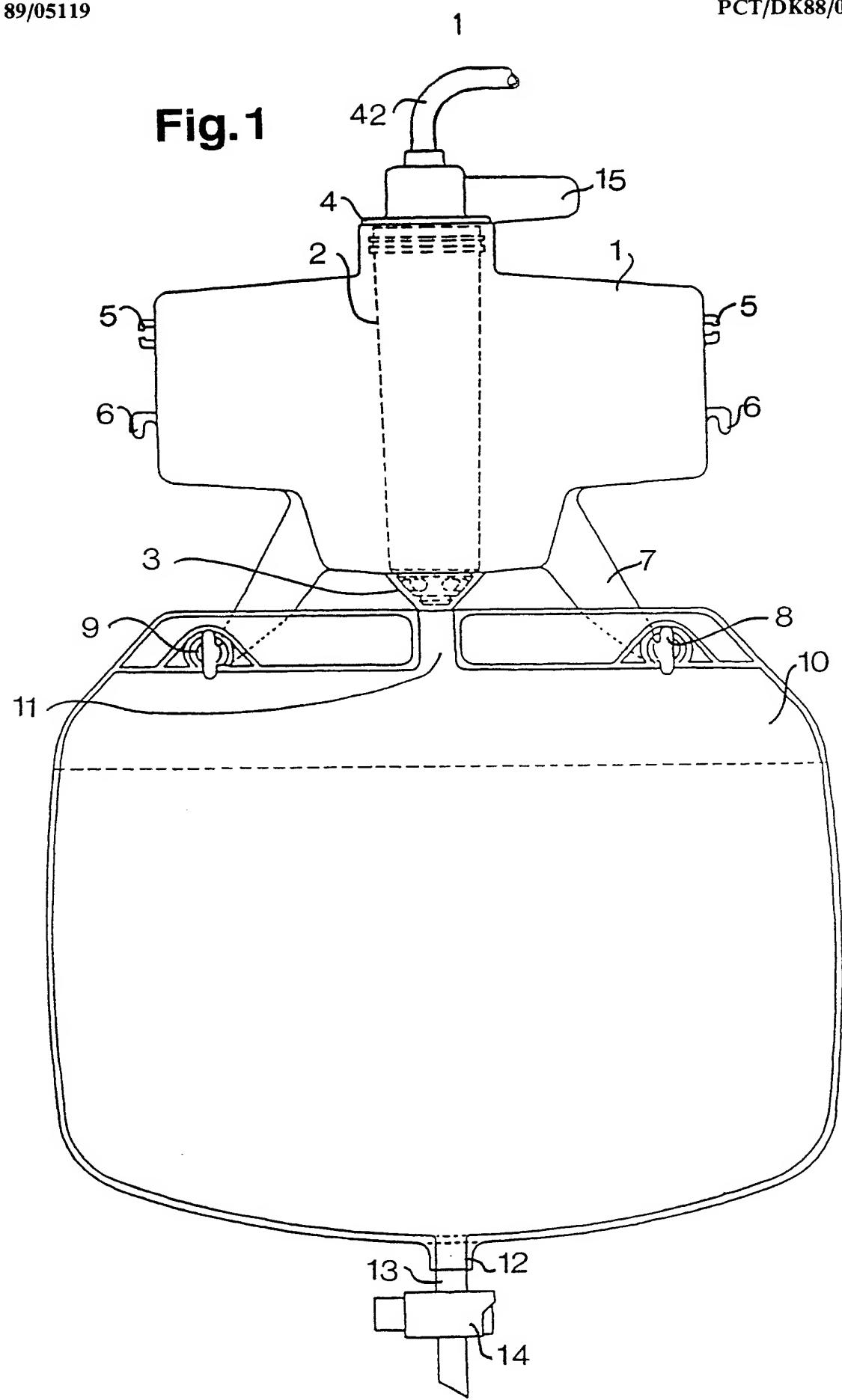
15 8. An apparatus according to claim 6, characterized in that in the cover comprises an opening which is covered by an air permeable and liquid tight filter.

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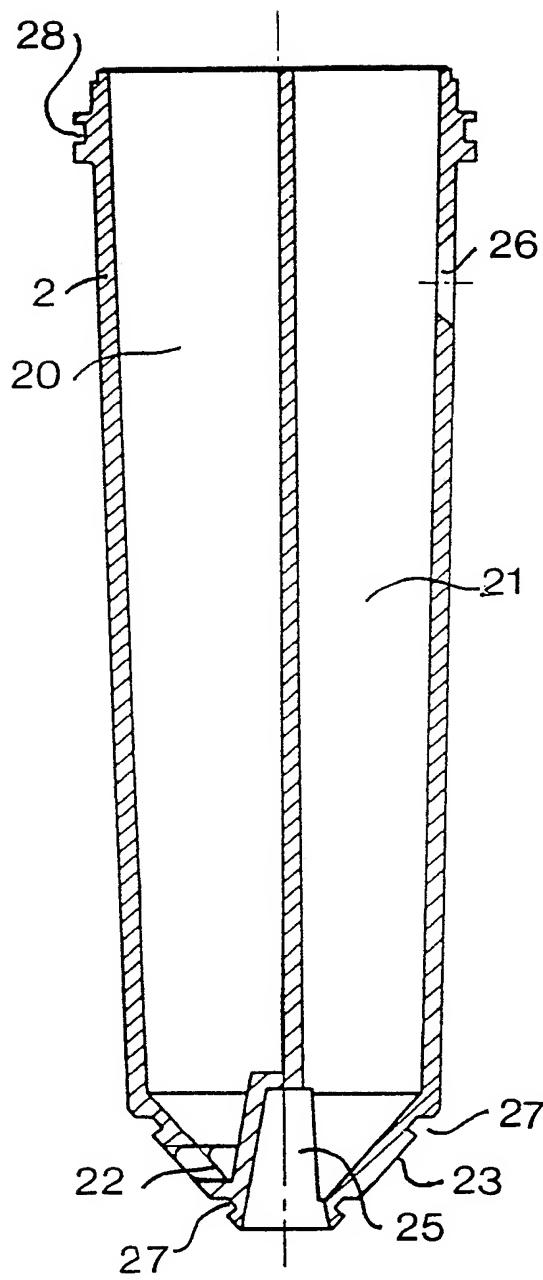


Fig.2

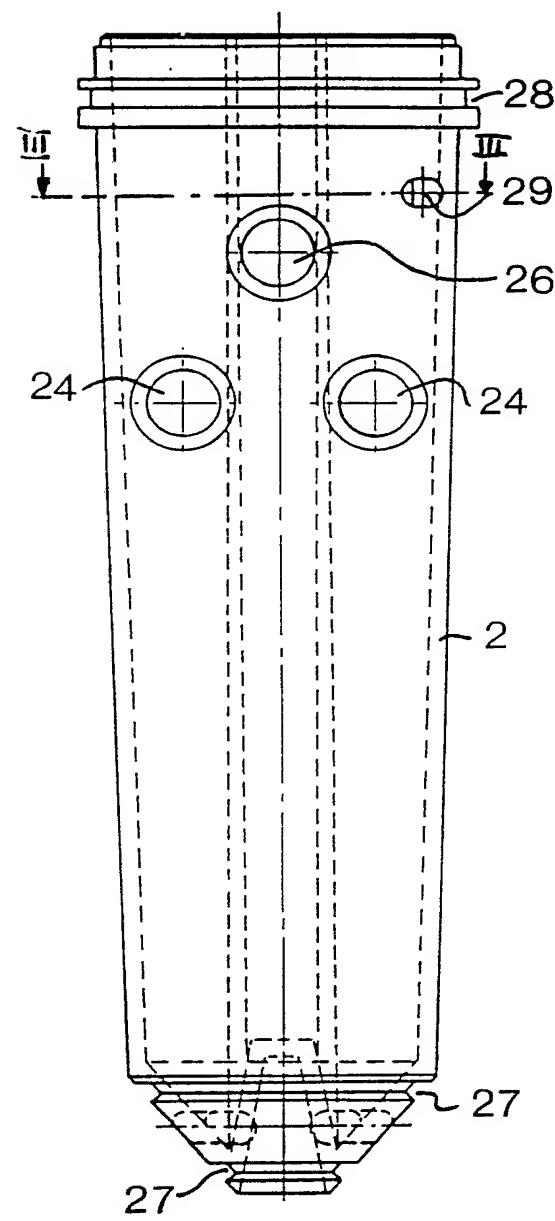


Fig.3

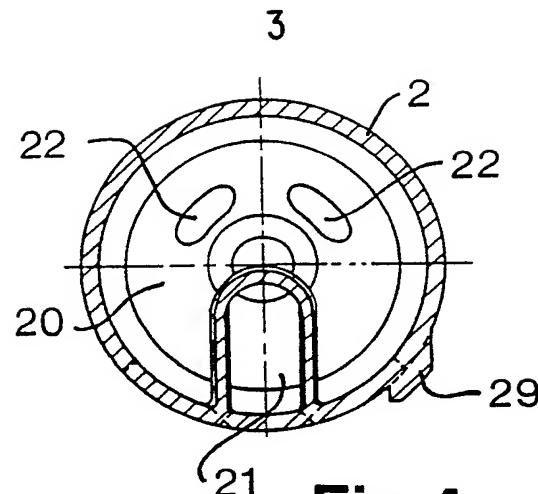
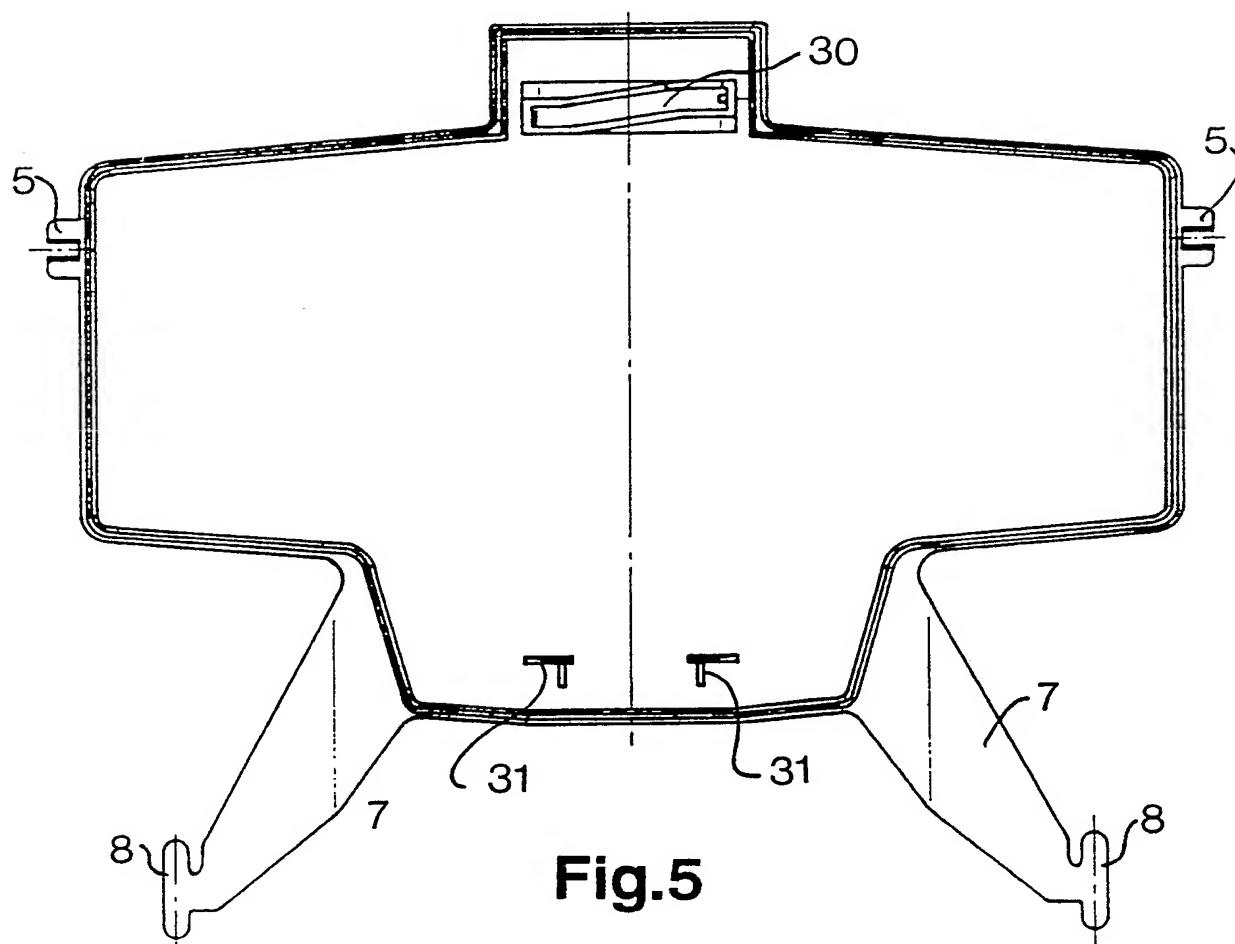
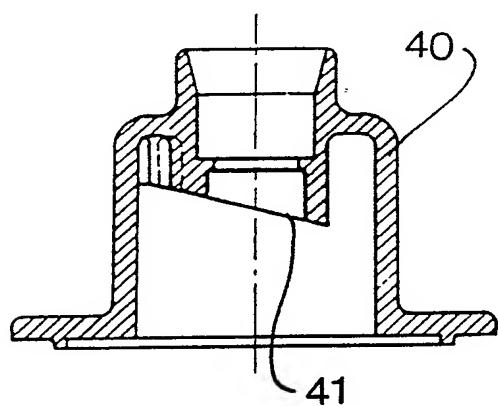
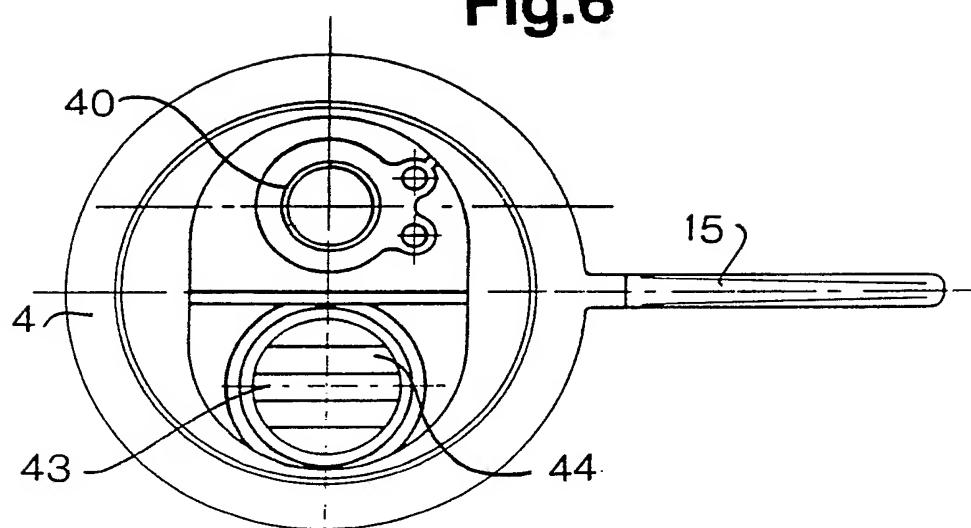
**Fig.4****Fig.5**

Fig.6**Fig.7**

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK88/00196

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC 4

A 61 B 5/20, A 61 F 5/45 // G 01 F 19/00

II. FIELDS SEARCHED

Minimum Documentation Searched *

Classification System	Classification Symbols
IPC 3, 4	A 61 B 5/00, /20; A 61 F 5/44, /451-/455; A 61 G 9/00; G 01 F 3/36, /38, 19/00
US Cl	4:110, 144.1-144.4; 73:219, 426, 427; . . . / . . .

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched *

SE, NO, DK, Fi classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT *

Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	SE, B, 447 336 (MEDIPLAST AB) 10 November 1986	1
A	US, A, 4 579 126 (CIANCI) 1 April 1986	1
A	US, A, 4 625 734 (SHERLOCK ET AL) 2 December 1986	1, 3, 7

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- "&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

1989-03-07

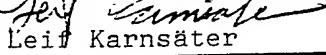
Date of Mailing of this International Search Report

1989-03-09

International Searching Authority

Swedish Patent Office

Signature of Authorized Officer


Leif Karnsäter

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET**II Fields searched (cont.)**

128:2F, 275, 294, 295, 760-771;
604:317-331, 346-352

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE¹

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. Claim numbers because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim numbers because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically

3. Claim numbers because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING²

This International Searching Authority found multiple inventions in this international application as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- The additional search fees were accompanied by applicant's protest.
- No protest accompanied the payment of additional search fees.